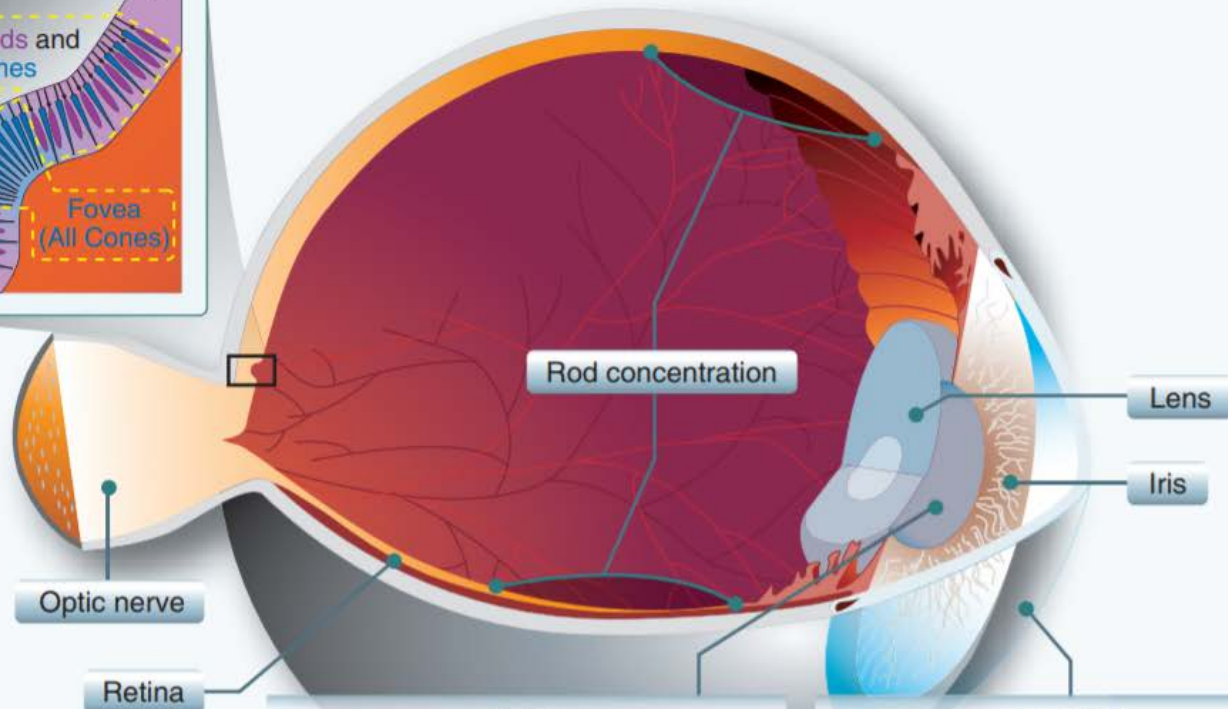
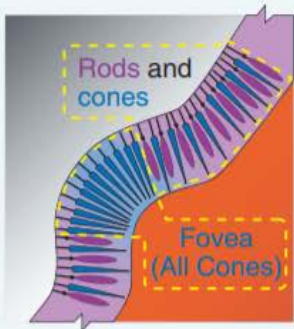


NIGHT FLYING PHYSIOLOGICAL CONDITIONS AND VISUAL ILLUSIONS

The Human Eye

The **rods** and **cones** (film) of the **retina** are the receptors which record the image and transmit it through the **optic nerve** to the brain for interpretation.



PUPIL

The **pupil** (aperture) is the opening at the center of the **iris**. The size of the pupil is adjusted to control the amount of light entering the eye.

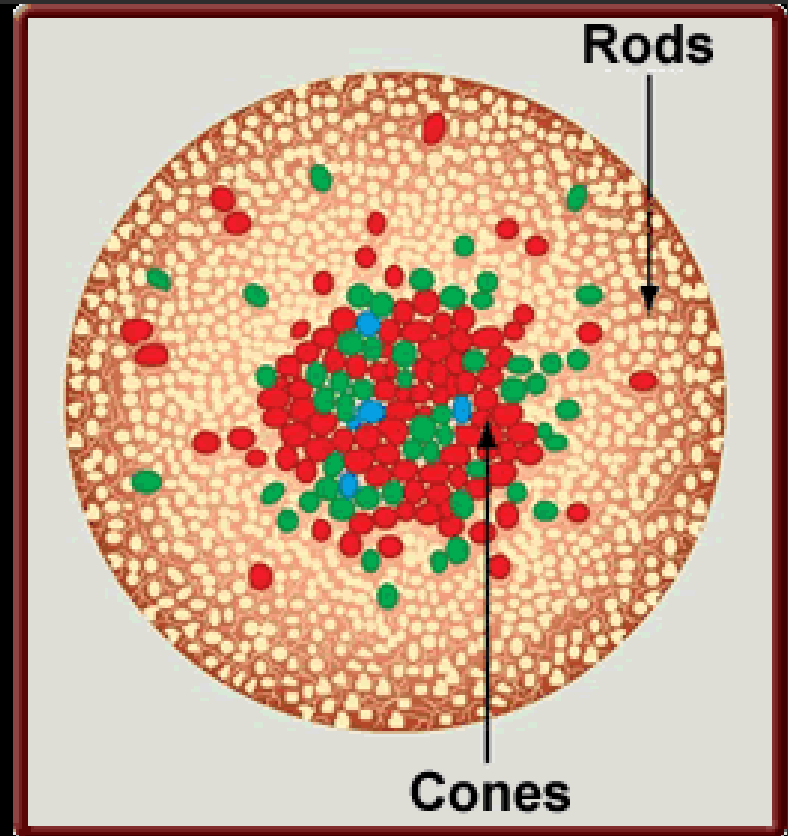
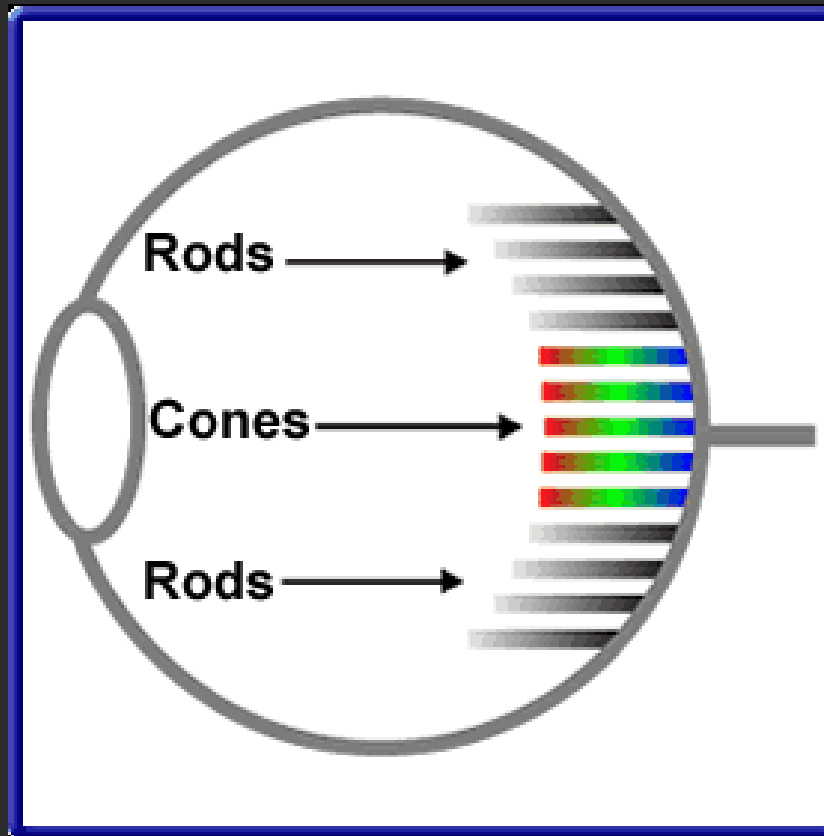
CORNEA

Light passes through the **cornea** (the transparent window on the front of the eye) and then through the **lens** to focus on the retina.

Cones and Rods

- ▣ Two kinds of light sensitive cells in the eye: Cones and Rods.
- ▣ Cones are responsible for all color vision and are concentrated toward the center of the eye at the back of the retina.
- ▣ Rods are unable to detect color and provide vision in dim light. A large amount of light overwhelms them and they take longer to “reset”.

Cones and Rods



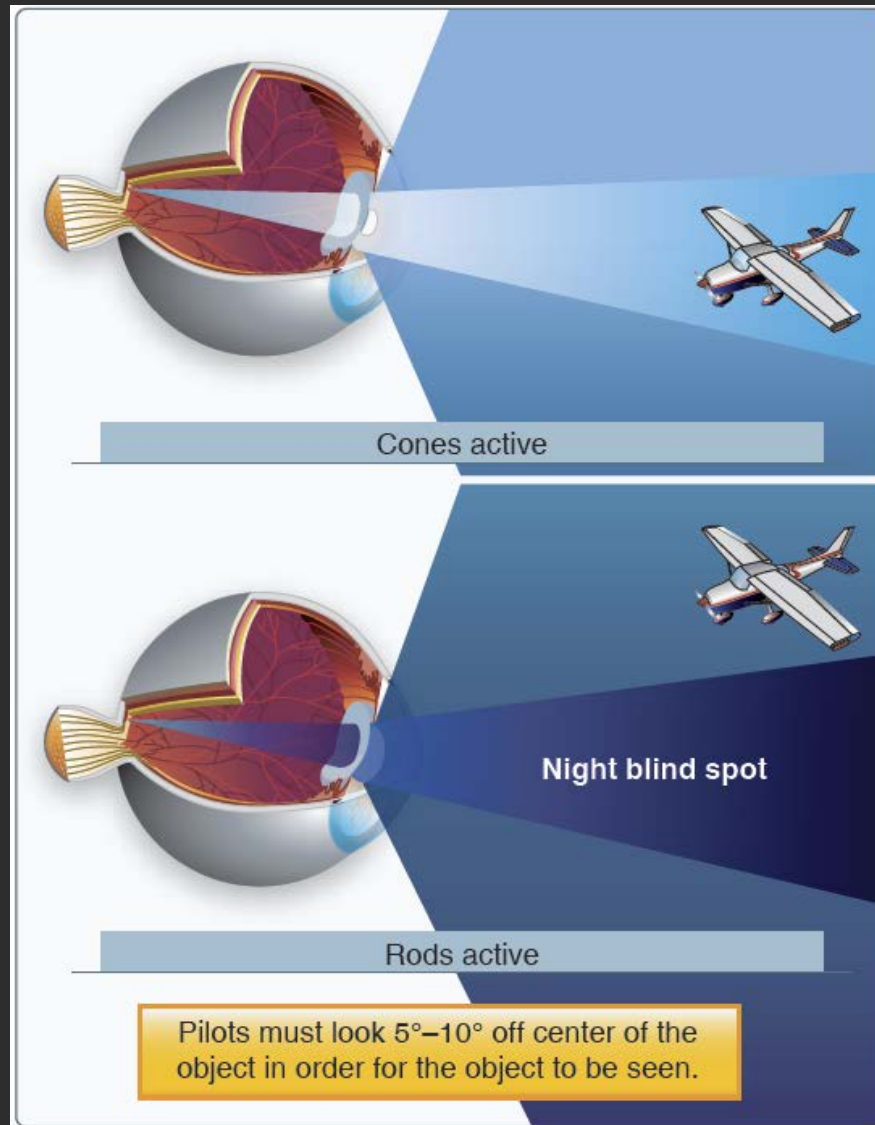
Dark Adaptation

- ▣ Dark adaptation is the adjustment of the human eye to a dark environment. That adjustment takes longer depending on the amount of light in the environment that a person has just left. Moving from a bright room into a dark one takes longer than moving from a dim room and going into a dark one.

Night Blind Spot

- ▣ The small area where the optic nerve connects to the retina contains more cones than rods. This area at night becomes useless and is called the night blind spot.
- ▣ To see an object clearly at night look about 5° to 10° off center of the object to be seen.

Night Blind Spot



Vision Types

- ▣ Photopic- daytime color, primarily cones.
- ▣ Mesopic- combination of cones and rods during low light such as dawn, dusk, and full moonlight.
- ▣ Scotopic- nighttime, no cone or color sensitivity.

Night Vision Illusions

- ▣ Visual illusions result from the absence of visual references or the alteration of visual references, which modify the pilot's perception of his or her position (in terms of height, distance, and/or intercept angle relative to the landing area).
- ▣ Visual illusions can affect the pilot's situational awareness, particularly when landing.

Night Vision Illusions

▣ Autokinesis

- Autokinesis is caused by staring at a single point of light against a dark background for more than a few seconds.
- This illusion can be eliminated or reduced by visual scanning.

Night Vision Illusions

▣ Size-Distance Illusion

- This illusion results from viewing a source of light that is increasing or decreasing in luminance (brightness). Pilots may interpret the light as approaching or retreating.

Night Vision Illusions

- ▣ Fascination (Fixation)
 - This illusion occurs when pilots ignore orientation cues and fix their attention on a goal or an object. At night, this can be especially dangerous because aircraft ground-closure rates are difficult to determine.

Night Vision Illusions

▣ Night Landing Illusions

- Above featureless terrain at night.
- Visual obscurities, such as rain, haze, or a dark landing environment.
- Bright lights and steep surrounding terrain.

Night Vision Illusions

- ▣ Prior to flying at night, it is best to learn and know the challenges of the area in which you are flying in. Study the area and know how to navigate your way through areas that may pose a problem at night.